



Armed Forces College of Medicine AFCM



Female Reproductive system Ovulation

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INTENDED LEARNING OBJECTIVES (ILO)



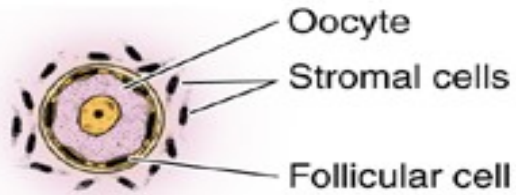
By the end of this lecture the student will be able to:

1. Describe the microscopic structure (LM & EM) of the different corpora lutea.
2. Correlate the microscopic structure of the cells of the corpus luteum to its function

Ovarian follicles



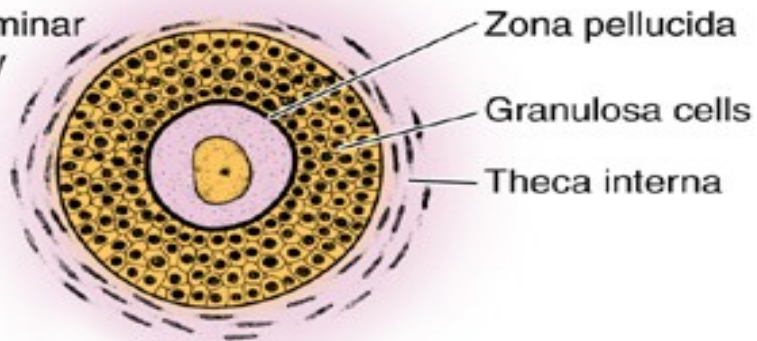
Primordial follicle



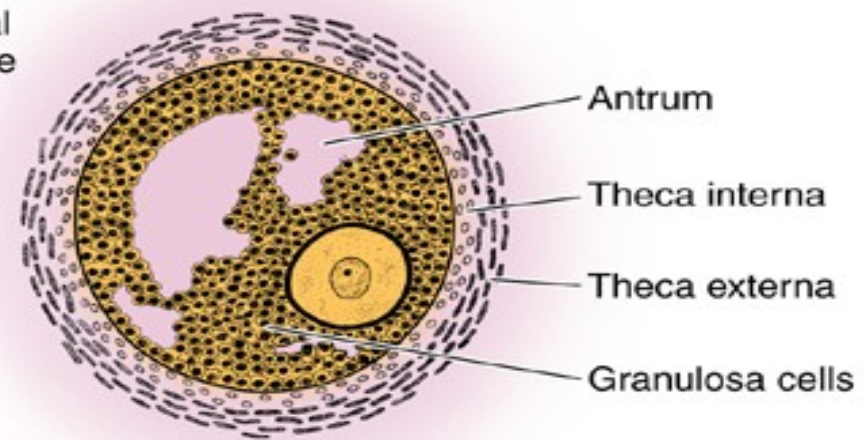
Unilaminar primary follicle



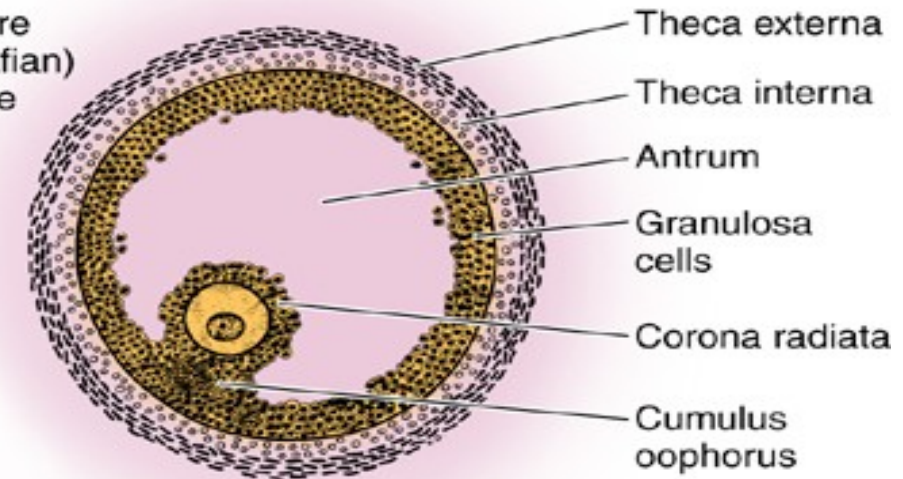
Multilaminar primary follicle



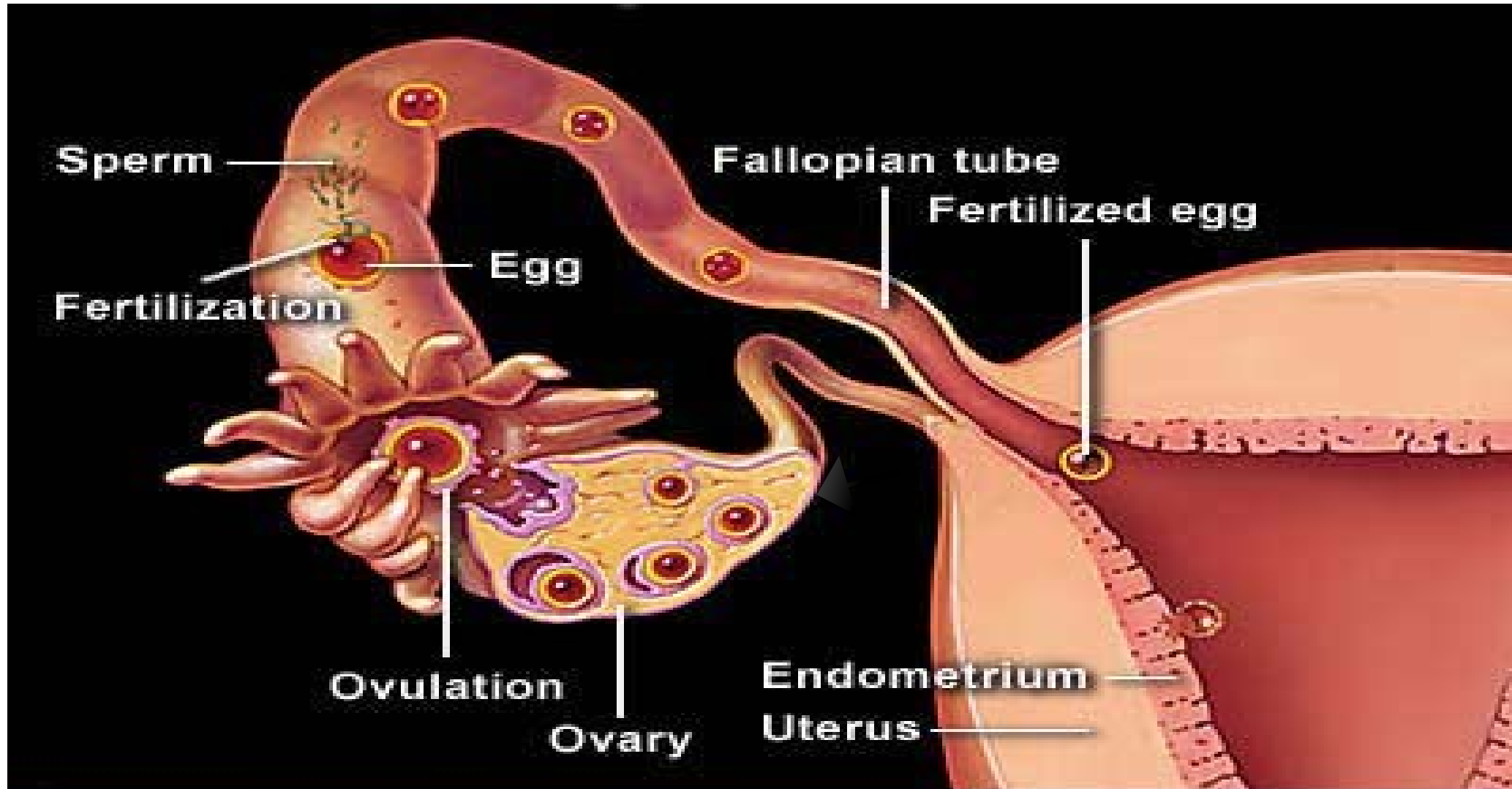
Antral follicle



Mature (graafian) follicle

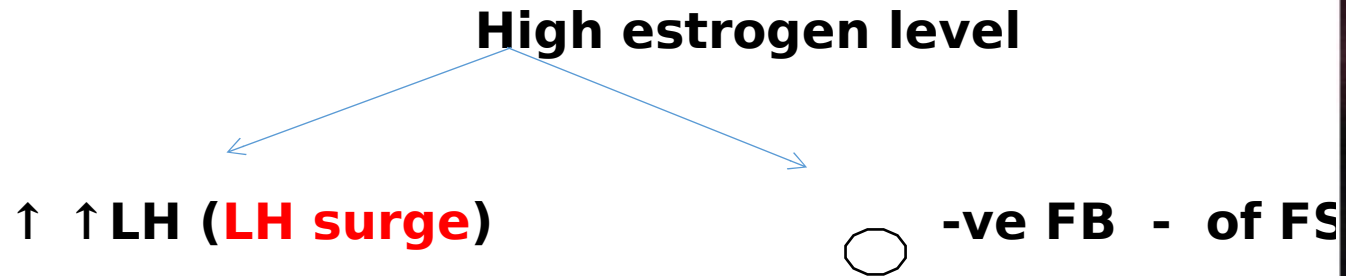


OVULATION



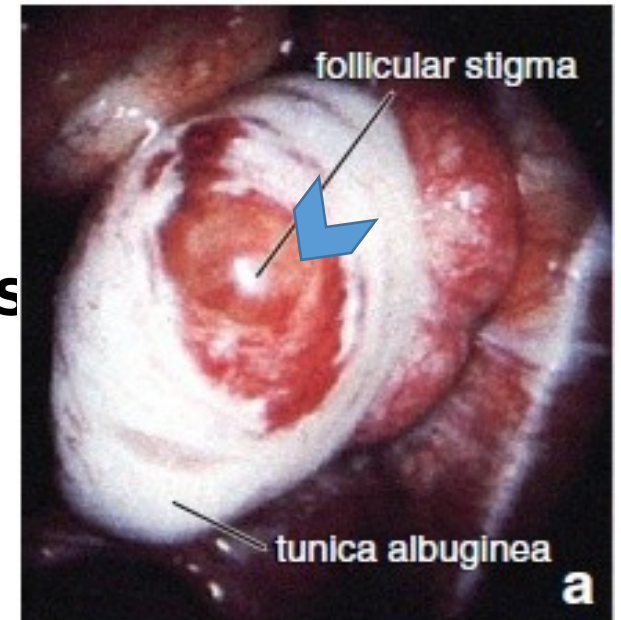
OVULATION

- **Def. :** Ovulation is the process by which the mature follicles rupture with the release of 2ry oocyte with its *corona radiata & cumulus cells*.
- **Time:** **middle of menstrual cycle (14th day of a 28 day cycle).**
- **Induced by:**



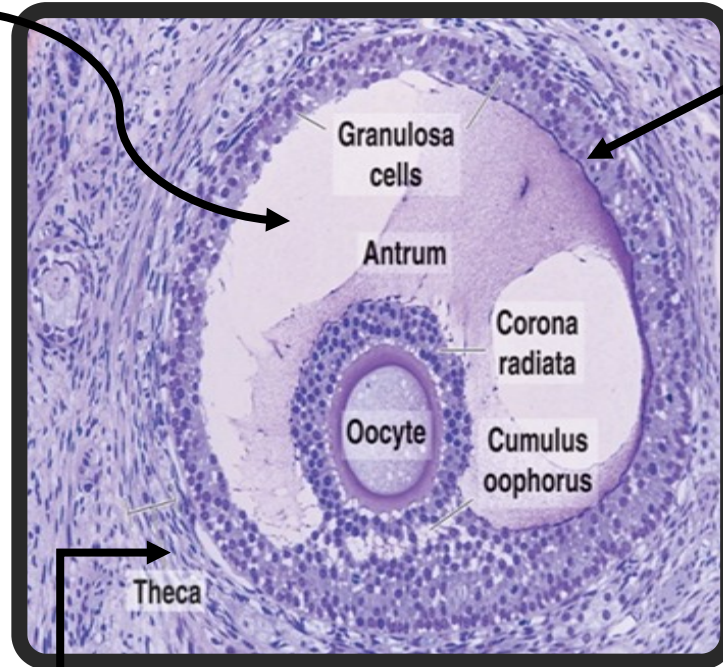
- **Before ovulation: under effect of LH**

- 1- The 1st meiotic division is completed → 2ry oocyte & 1st polar body.
- 2- ↑ secretion of liquor.
- 3- The appearance of a pale area on bulging pole of follicle called *stigma*.
- 4- The germinal epithelium over this area → thin & discontinuous.



Mechanisms facilitating ovulation

↑ **hyaluronic acid** → ↑ **pressure** inside follicle



theca cells secrete an activator → convert plasminogen → **plasmin** → degrade the B.L. around the follicle → weaken ovarian wall.

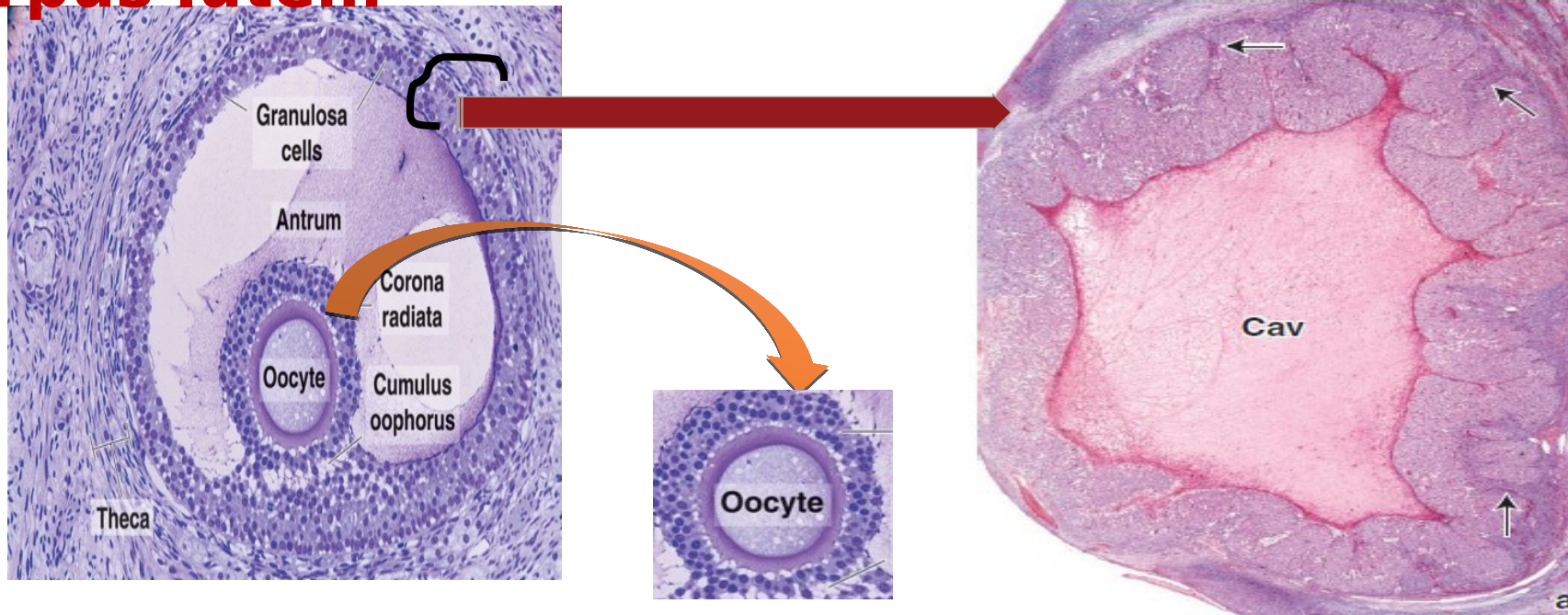
Contraction of smooth ms in theca externa by **PGs**.

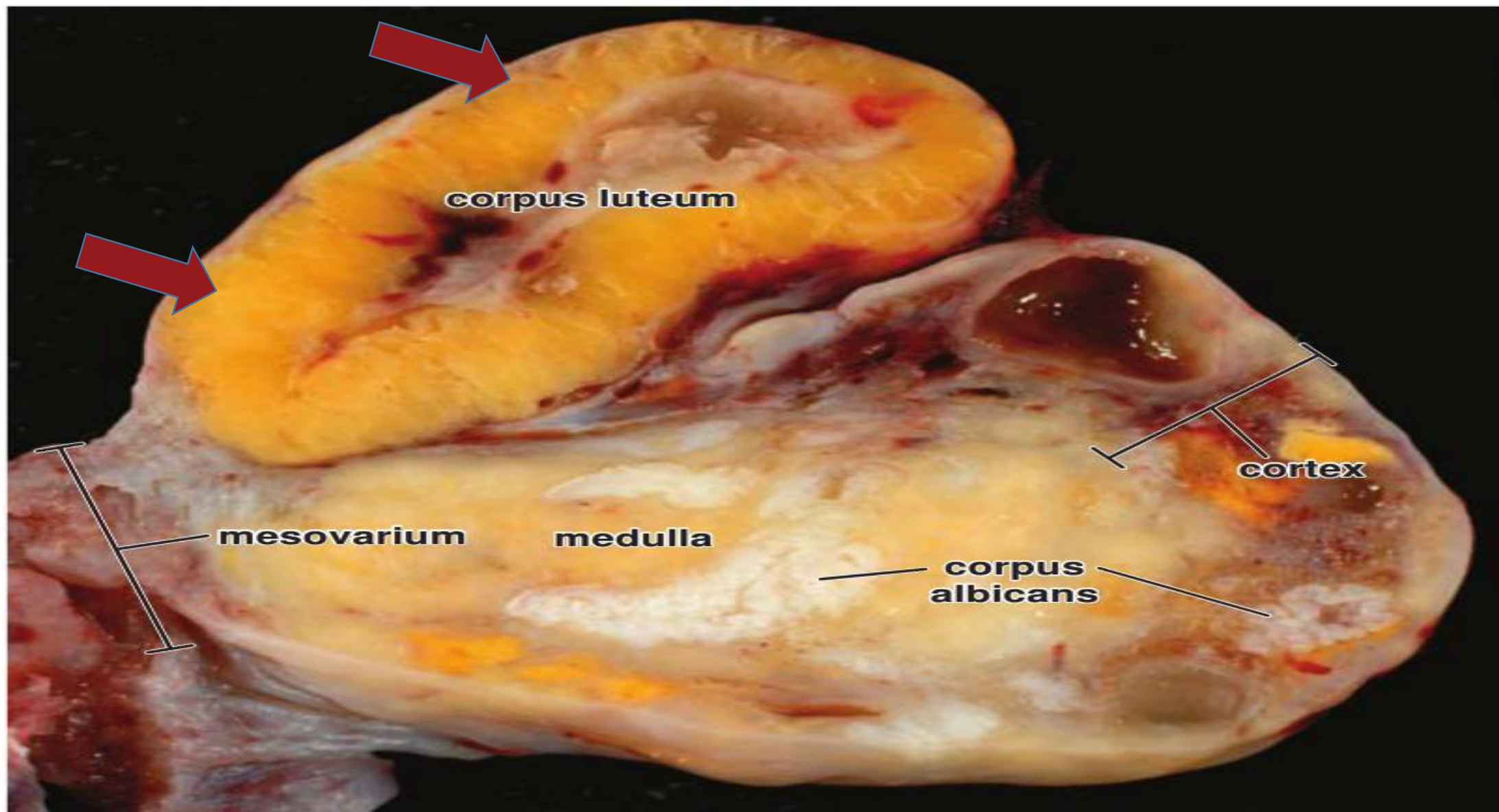
↑ **collagenase** enzyme by granulosa cells → dissolution of C.T. in tunica albuginea at the stigma

The corpus luteum


□ The end result of ovulation is:

- The oocyte detaches itself with *its attendant follicular cells* → floats in follicular fluid.
- Formation of a temporary endocrine gland called → **corpus luteum**





The corpus luteum

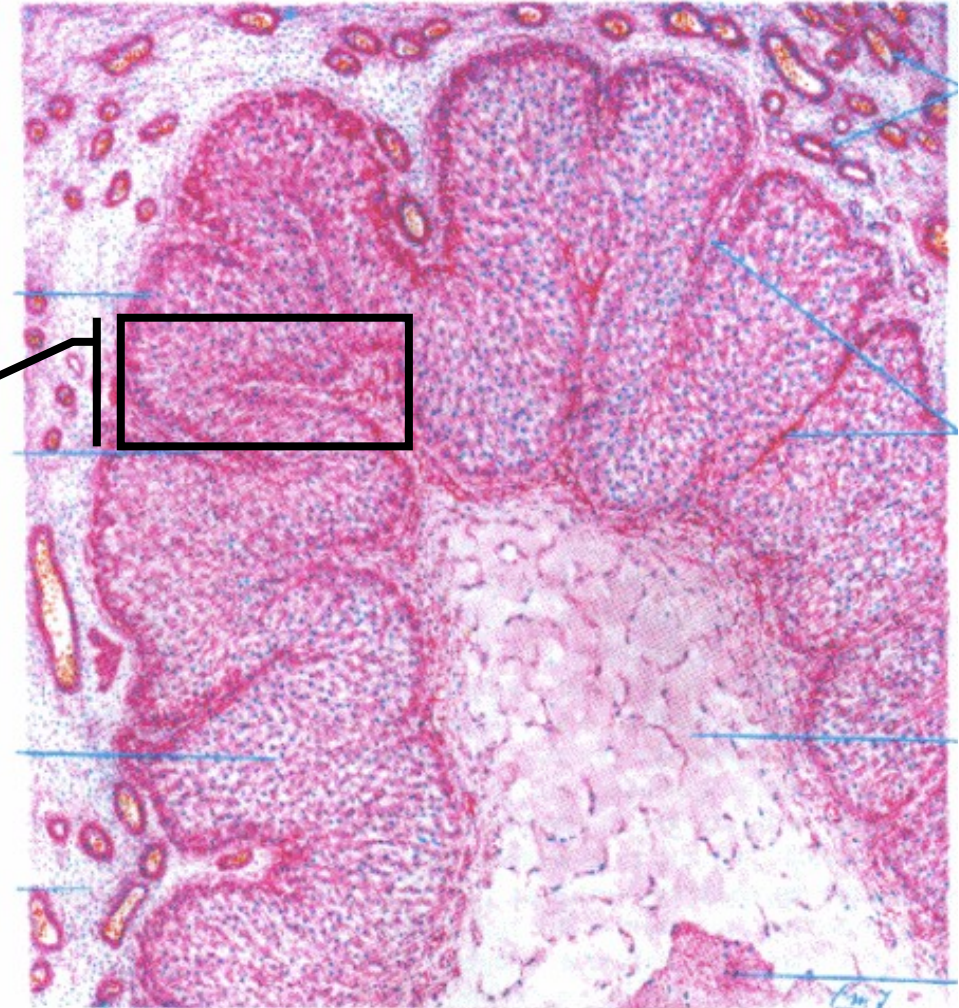
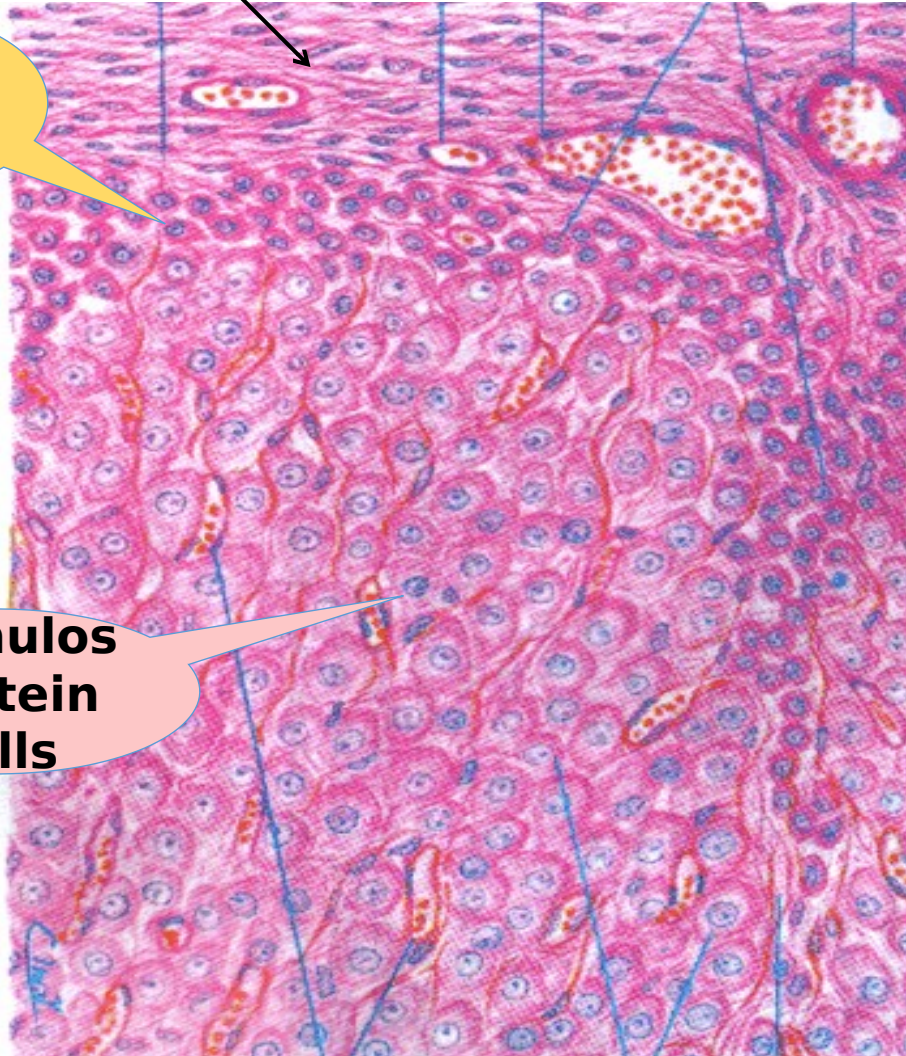
- Temporary endocrine organ (progesterone and some estrogen).
 - After ovulation and under effect of **LH** → the wall of the follicle collapses → become deeply infolded forming the **yellow body** rich with **lipochrome pigments**  luteinization process.
 - The B.M. disappears and blood vessels invade the granulosa cells.
-
- **Structure:**
 - I- Granulosa lutein cells.
 - II- Theca lutein cells.

The Corpus Luteum

Capsule

**Theca
lutein
cells**

**Granulosa
lutein
cells**



GRANULOSA LUTEIN CELLS

- Origin: from granulosa cells.
- Central in position
- Form the majority (80%)

L/M:

- Large, pale cytoplasm
- pale nucleus.

E/M: Steroid secreting cells.

Function:

- 1- Secrete **progesterone** → preparation of

THECA LUTEIN CELLS

- Origin: from theca interna cells.
- Peripheral in position
- 20% of cells

L/M:

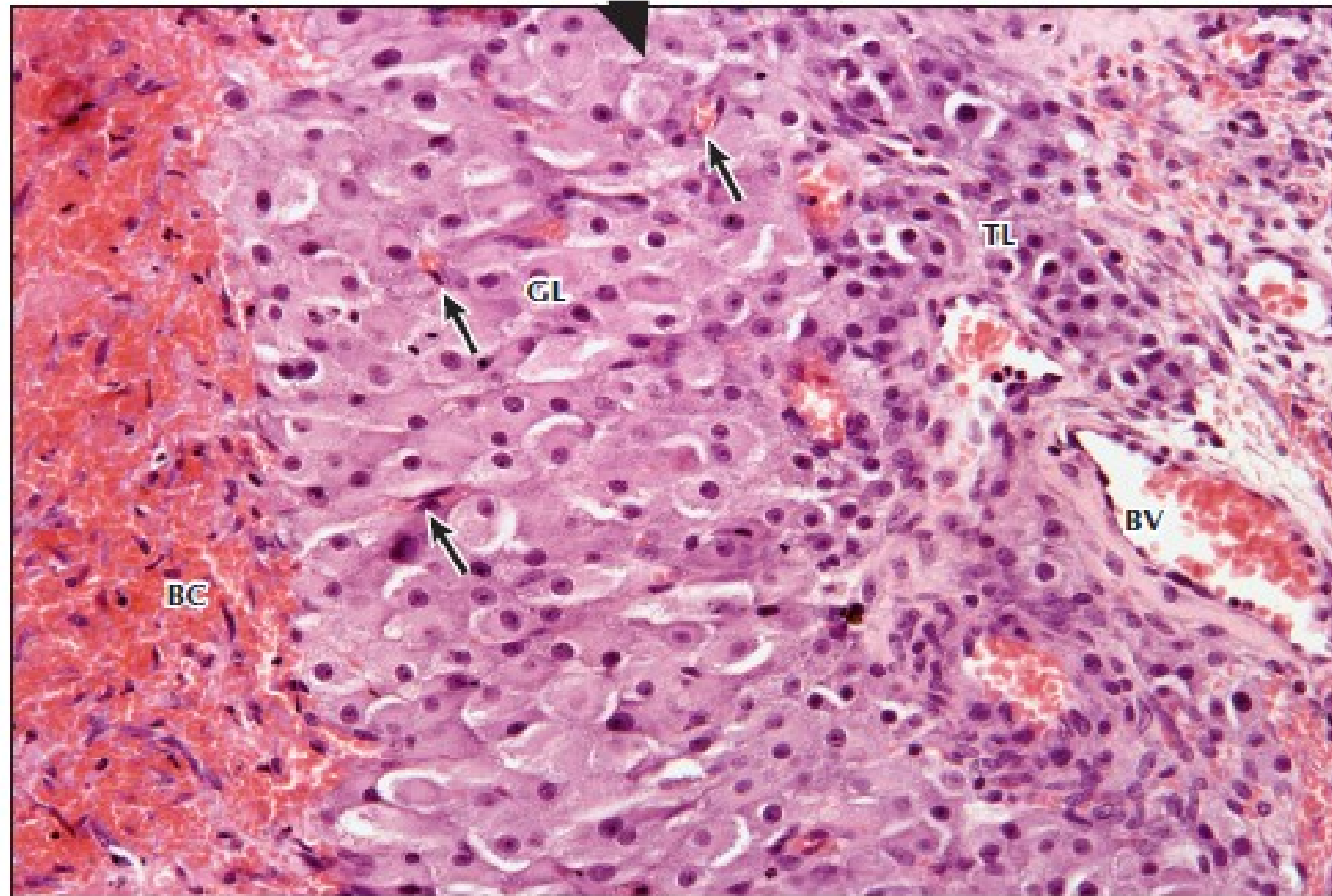
- Smaller, dark cytoplasm
- **dark nucleus.**

E/M: Steroid secreting cells.

Function:

- 1- Secrete **progesterone** → to prevent more development of **other** follicles

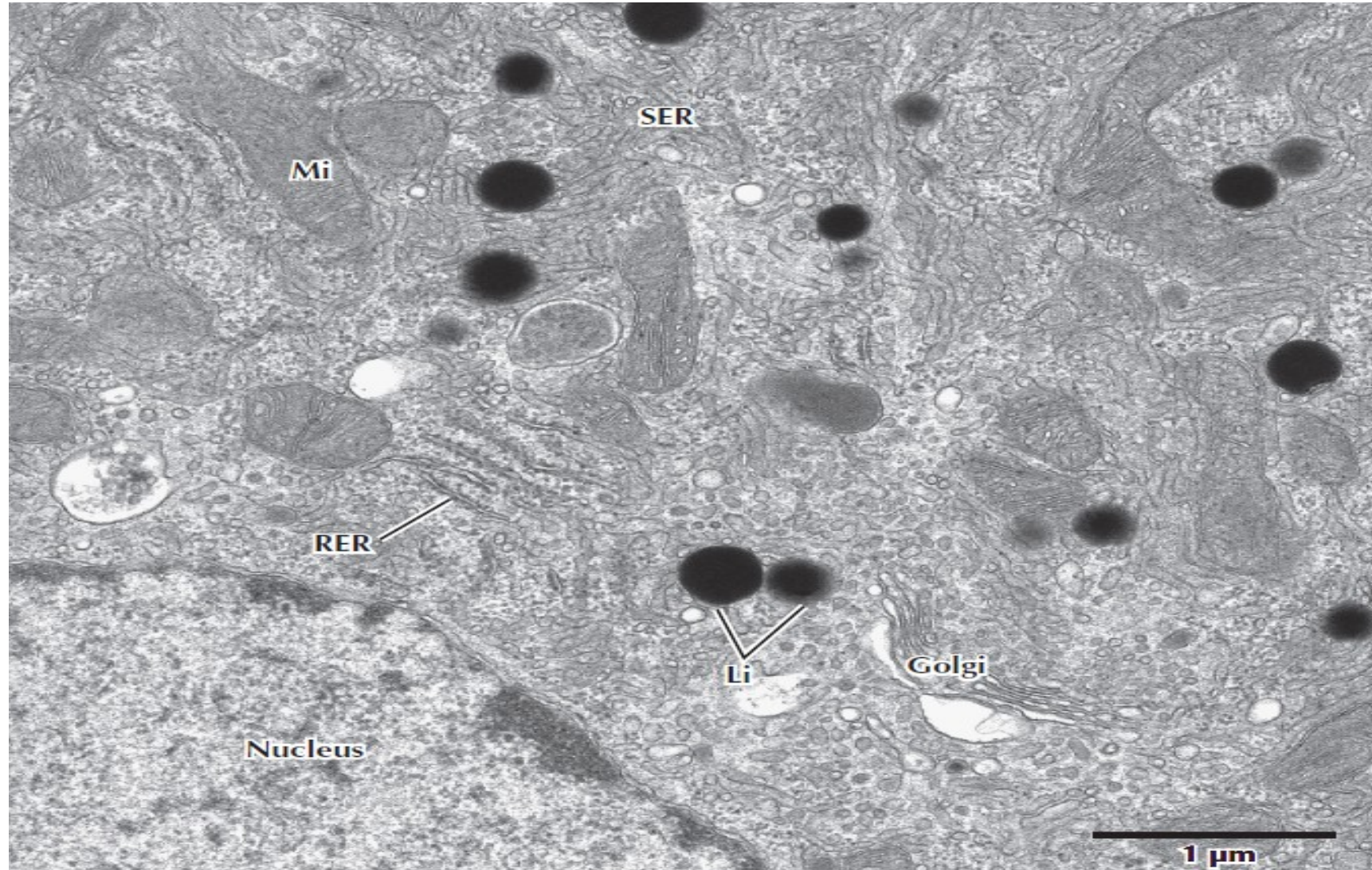
- 2- Secrete **androgen**



Corpus Luteum

Sec. E &P to prepare endometrium for pregnancy
until placenta is performing its function

E/M of granulosa lutein cells



Types of corpora lutea

1- Corpus luteum of menstruation:

- If fertilization doesn't occur → C.L. degenerates (after 10-12 days) → corpus albicans.

2- Corpus luteum of pregnancy:

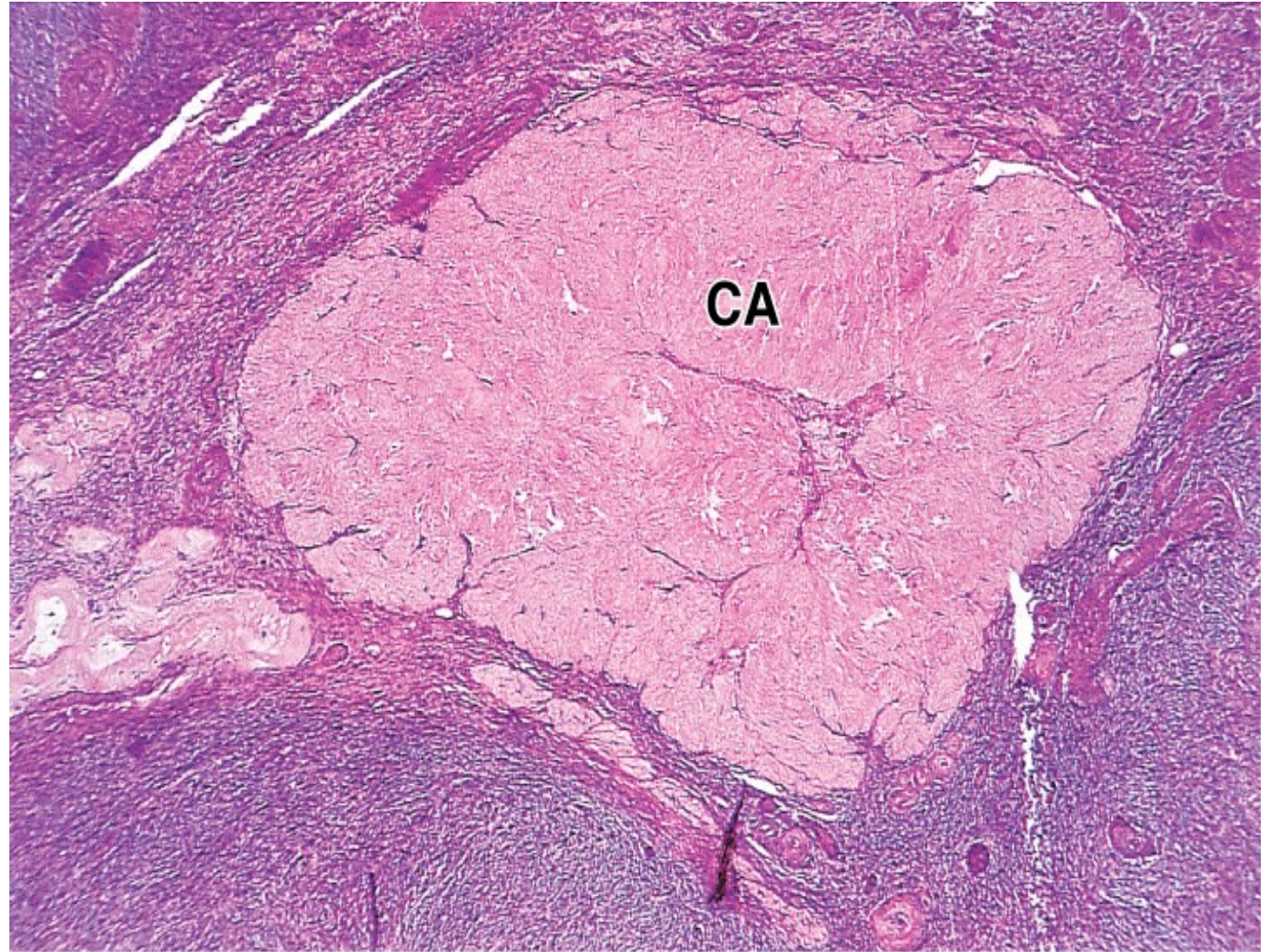
- If fertilization occurs → C.L. enlarges (up to 5 cm in diameter) and persists functioning for about 3-4 months.
- After that it declines as placenta becomes the main source of steroid.

3- Corpus haemorrhagicum:

- The C.L. may contain blood clot in its lumen (from bl. cap. in theca interna)

Corpus albicans

- The end result of any type of C.L. is → involution.
- C.L. is invaded by fibroblast → transformed into a small ovoid scar of dense C.T.

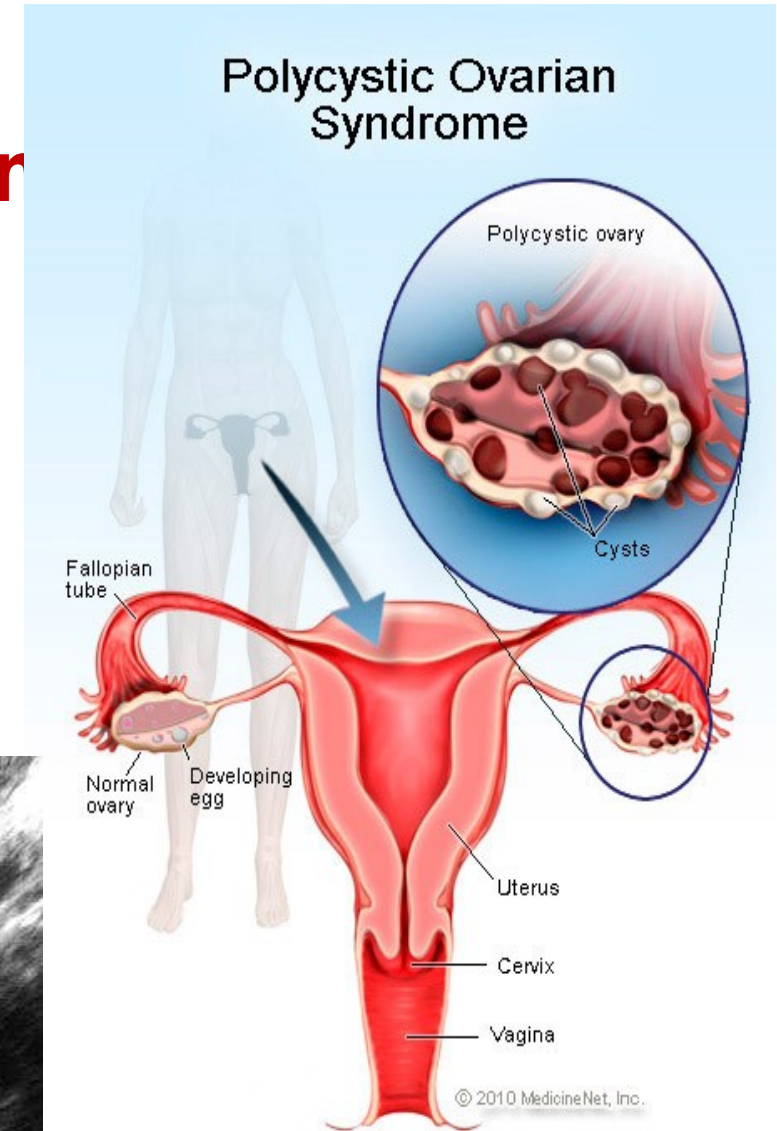




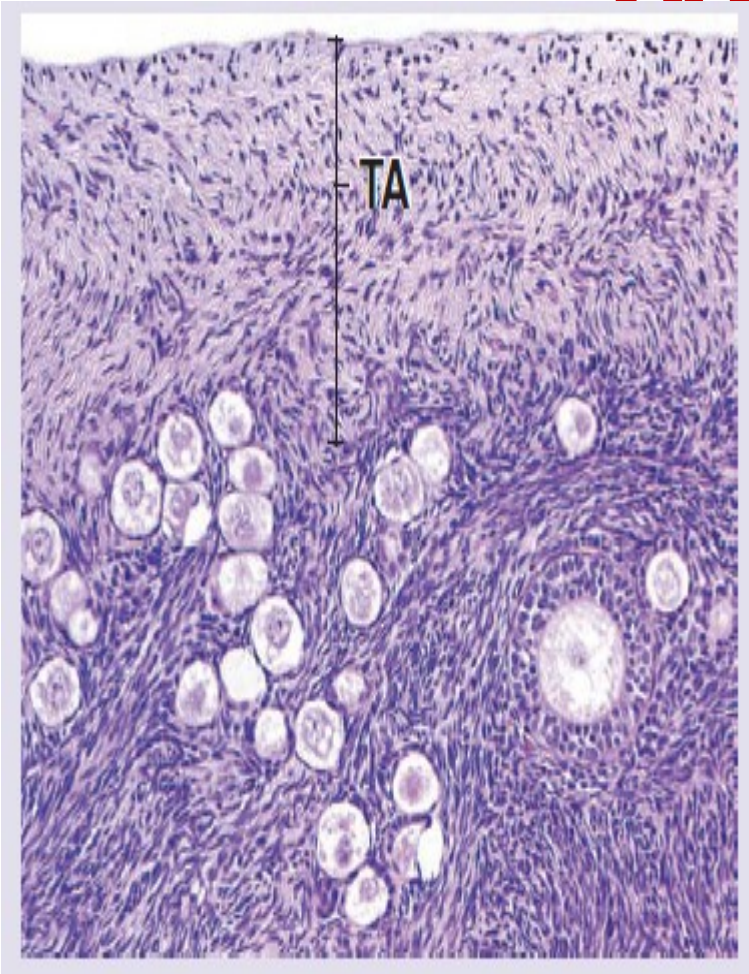
Clinical Correlation

Polycystic ovary Syndrome

- Due to hormonal imbalance (\uparrow androgens sec by the ovary) \rightarrow NO ovulation \rightarrow irregular menstrual cycle \rightarrow infertility.
- In addition to other symptoms:
- acne,
- hirsutism.
- Insulin resistance,
- weight gain.



Polycystic ovary Syndrome (PCOS)



- The “cysts” in polycystic ovaries are not true cysts, but rather *antral follicles* which have arrested in development.
- Thick tunica albuginea.

Laparoscopic surgery: ovarian drill

Notice:
size of
the
ovaries

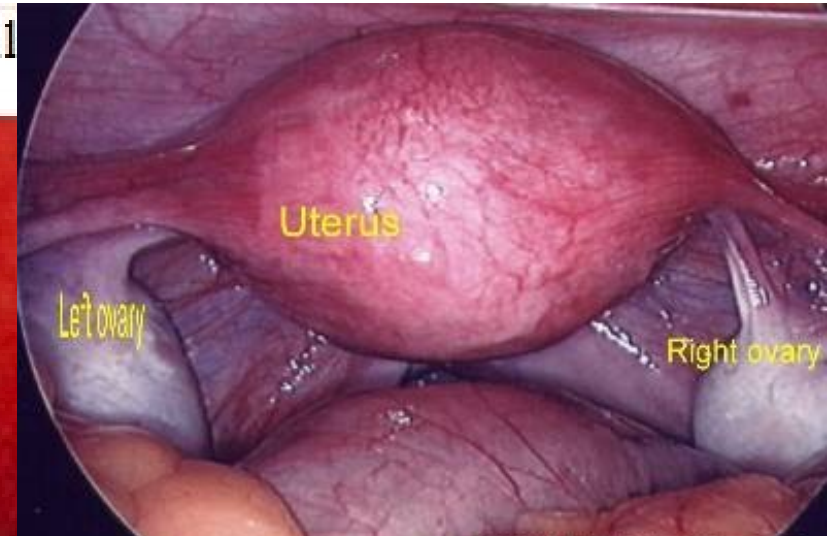
Uterus

Left
Polycystic
Ovary

Right
Polycystic
Ovary

Left
Fallopian
Tube

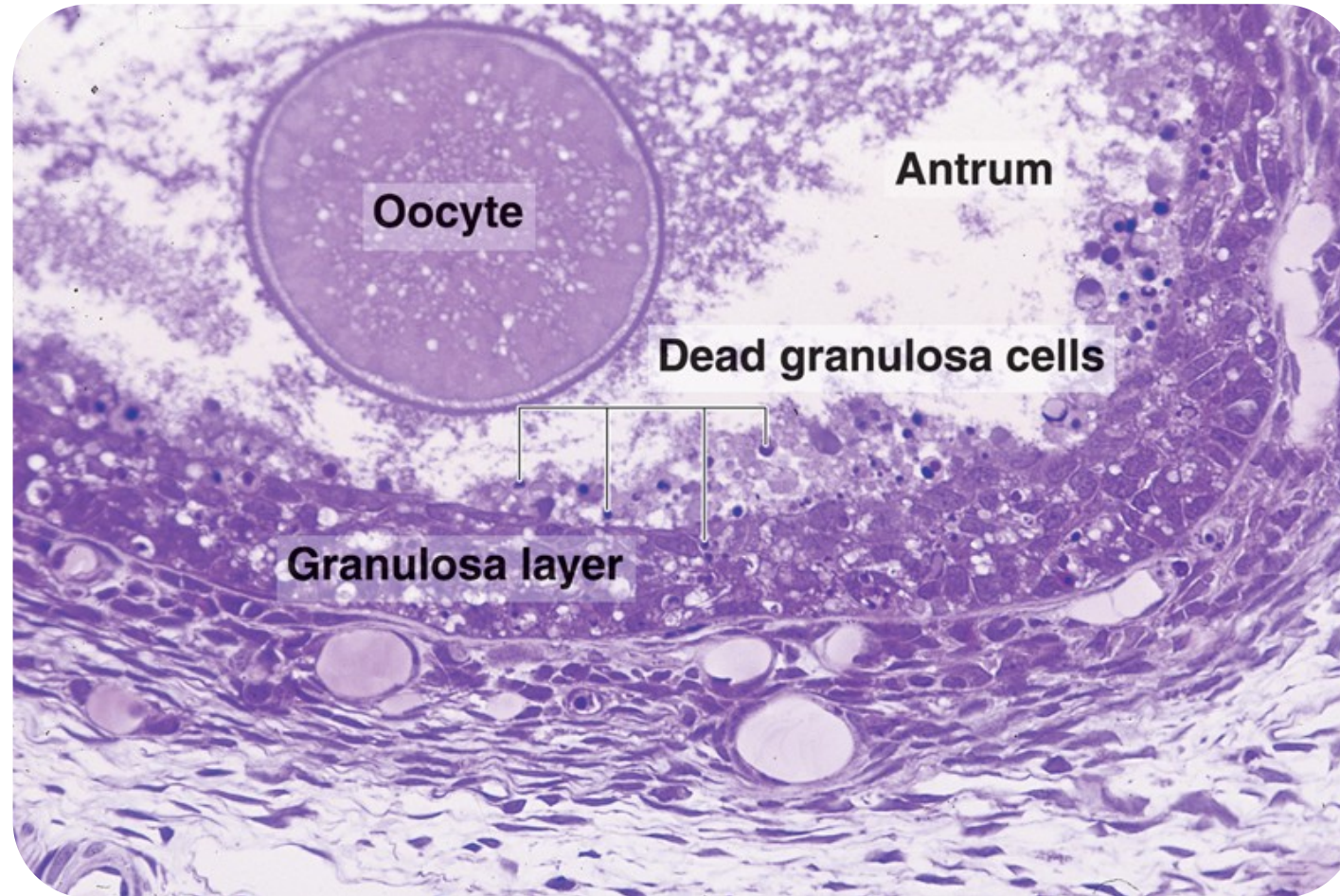
Bowel



ATRETIC FOLLICLE

- Most ovarian follicles degenerates and only one oocyte is released every 28 days.
- Only **0.1%- 0.2%** develop to maturity and undergo ovulation.
- Atresia occurs at any stage of follicular development (1ry, 2ry, or non dominant Graafian follicles).
- Atresia occurs due to *apoptosis of granulosa cells* and invasion by fibroblasts → **fibrosis**.
- Then it will be phagocytosed by **macrophages**.

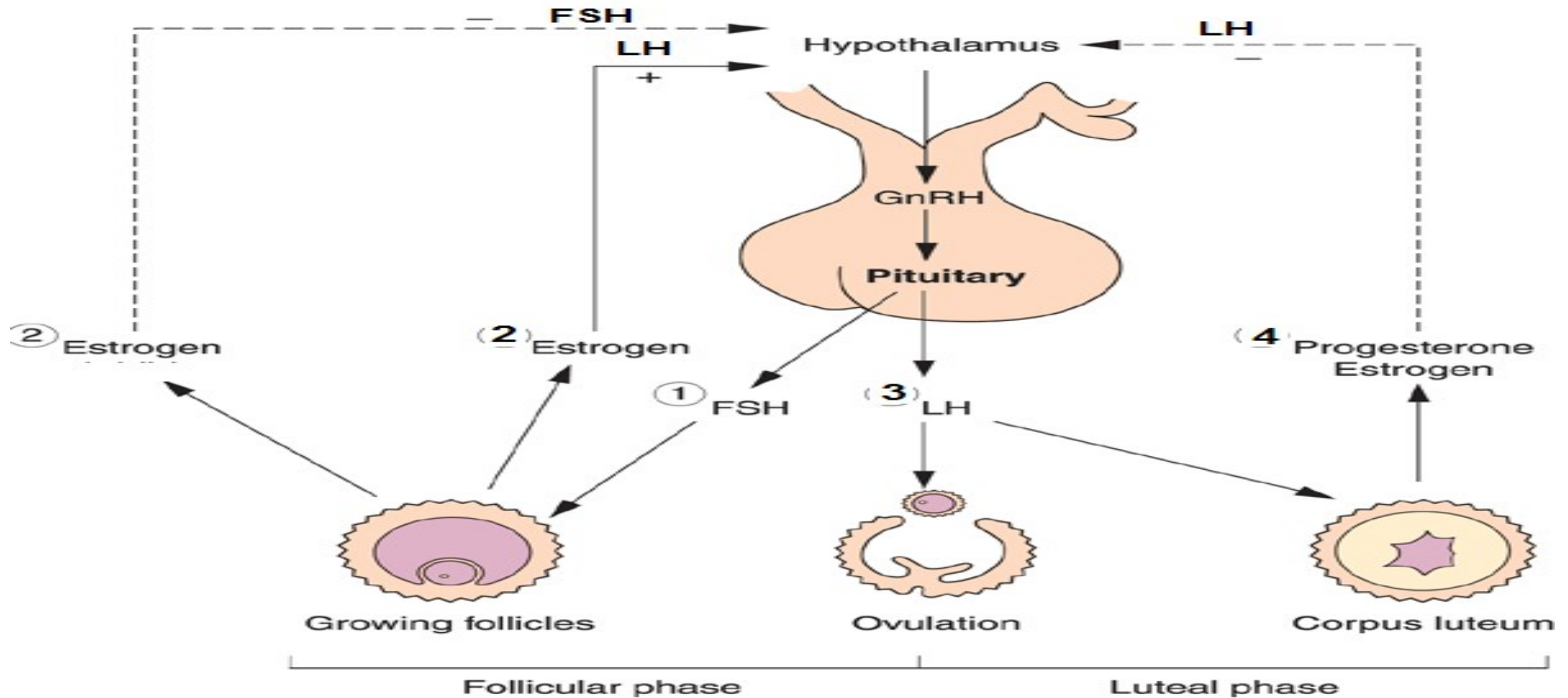
ATRETIC FOLLICLE



INTERSTITIAL CELLS

- **Origin:** theca interna of atretic follicle
- **L/M:** present in groups in the cortex, polygonal, pale with central nuclei
- **E/M:** steroid hormone secreting cells
- **Function:**
Secrete **androgen** (converted to estrogen by granulosa cells)????

Hypothalamo-hypophyseal-ovarian axis





Clinical Correlation

Mechanism of action of combined oral contraceptive pills (E&P)



- Prevents ovulation (level of FSH & LH).
- Thickens mucous in cervix
- Thins endometrium

□ Primary Use

- Prevent pregnancy

□ Secondary Uses

1. Heavy or irregular menstruation
2. Endometriosis
3. Polycystic ovary syndrome
4. Dysfunctional uterine bleeding



ACTIVITY

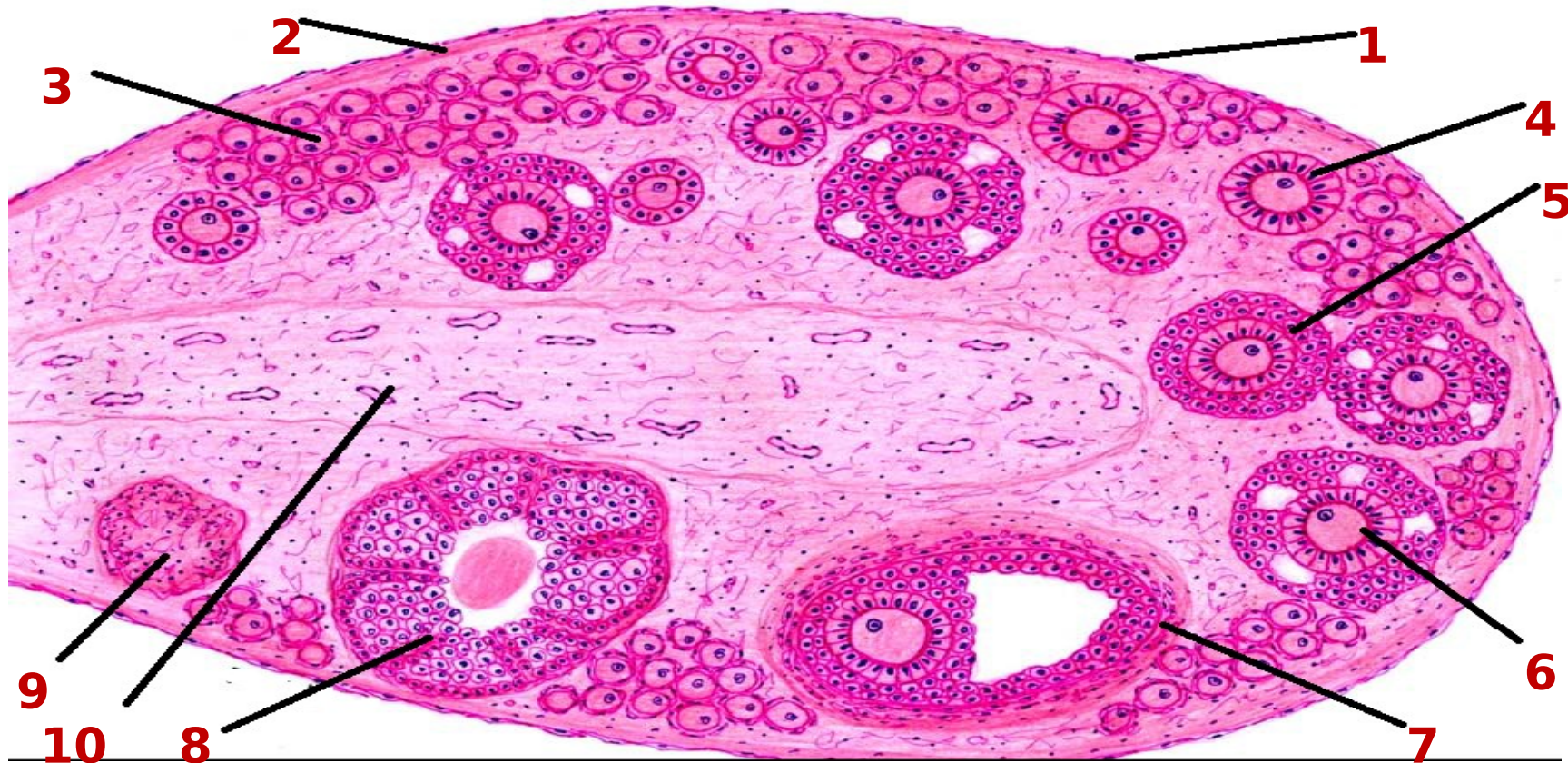
Infant ovary



Aging ovary

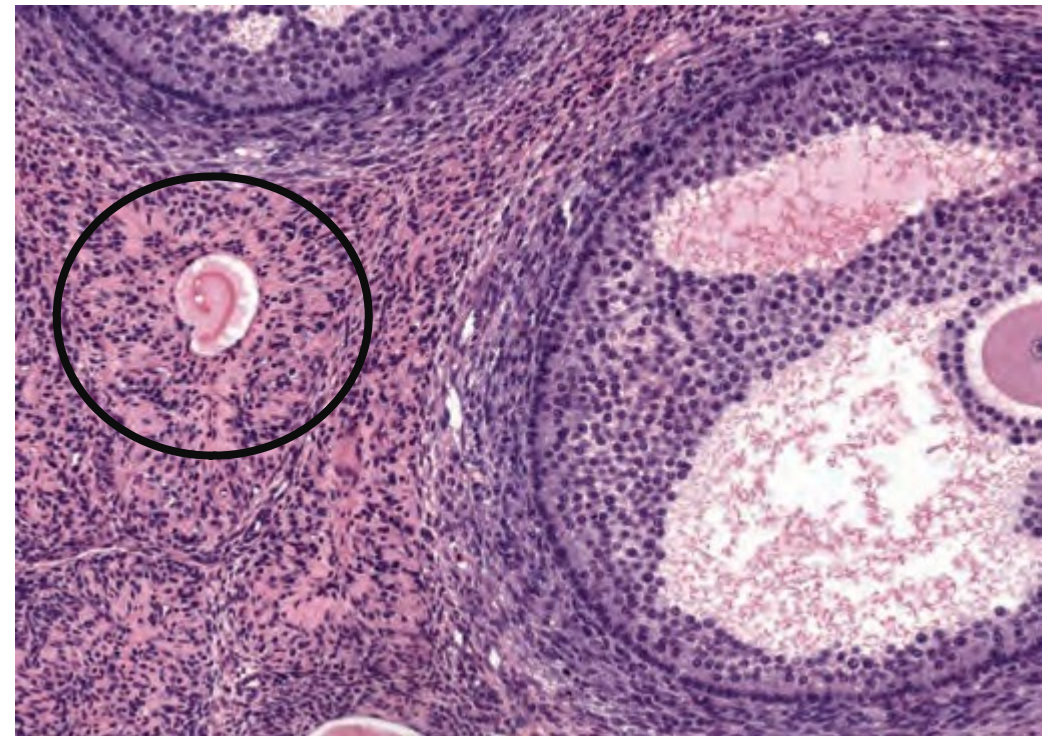


Activity



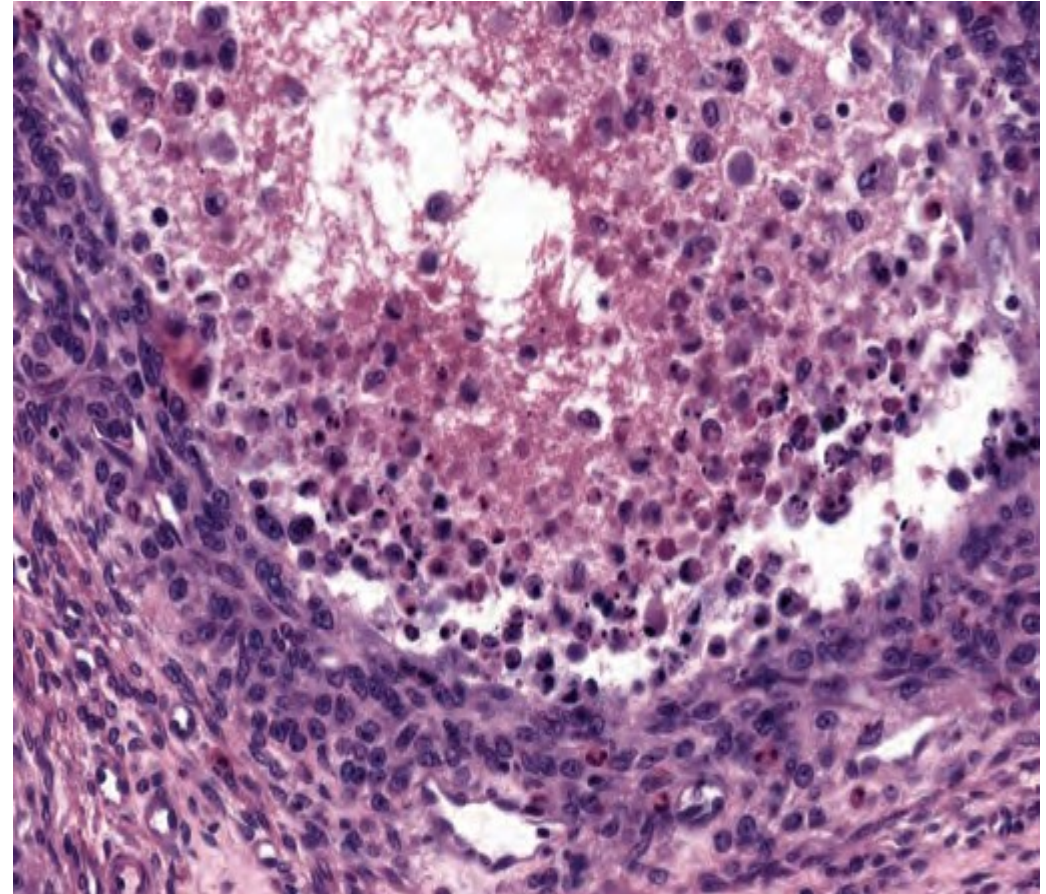
- **Ovarian tissue from an oophorectomy specimen is examined by light microscopy. Which of the following terms best describes the structure within the circle?**

- (A) Atretic follicle**
- (B) Corpus albicans**
- (C) Corpus luteum**
- (D) Primary follicle**
- (E) Primordial follicle**



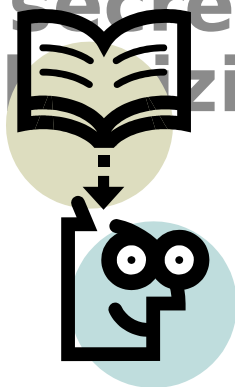
- **A section through the wall of an ovarian follicle undergoing atresia reveals scattered cellular debris and chronic inflammatory cells. This degenerative process is mediated by activation of apoptosis in which of the following ovarian cells?**

- (A) Theca externa cells**
- (B) Primary oocytes**
- (C) Stromal fibroblasts**
- (D) Granulosa cells**
- (E) Theca interna cells**



Assignment

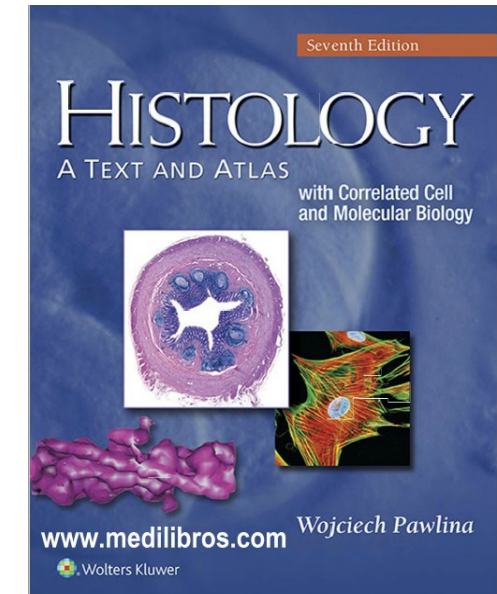
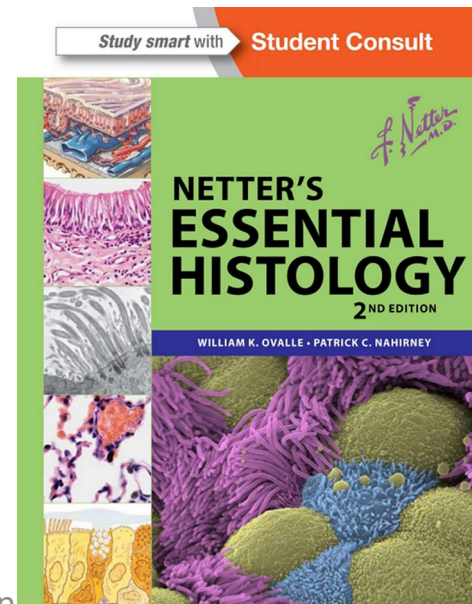
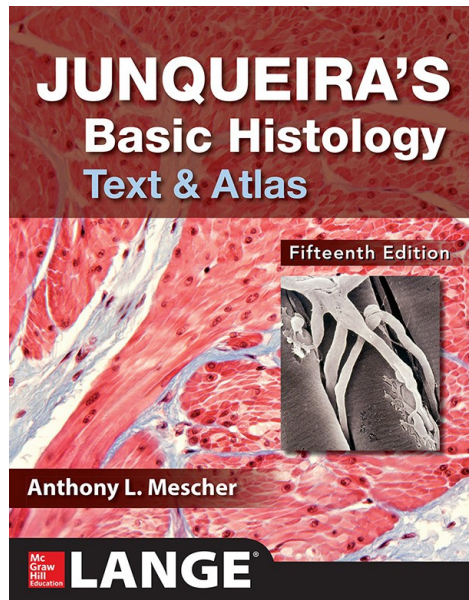
What are hormones secreted by the ovary and cells synthesizing them?



SUGGESTED TEXTBOOKS



1. **Junqueira's Basic Histology: Text and Atlas, 15th Edition by Anthony Mescher , 2018.**
2. **Michael H. Ross, Histology text and Atlas with correlated cell and molecular biology, 7th Edition, 2015.**
3. **Netter's Essential Histology, 2nd edition, 2013.**



Thank You So Much

The text "Thank You So Much" is rendered in a bubbly, 3D-style font. The word "Thank" is light blue, "You" is a medium blue, "So" is a darker blue, and "Much" is a vibrant purple. The letters have a fine, dotted texture. The text is adorned with several small, five-petaled flowers in shades of pink and light purple. A small, stylized logo is positioned at the bottom left of the word "Thank".